DEC 16 1921

PUBLIC WORKS

CITY COUNTY STATE

Tarvia
For Road Construction Repair and Maintenance

Fort Fisher Highway, New Hanover Co., N. C. Treated with "Tarvia-B" 1915-17-18-19-21 and "Tarvia-A" in 1916.

Wrightsville Turnpike, New Hanover Co., N. C. Treated with "Tarvia-A" 1915, and with "Tarvia-B" 1917 and 1921.

"The Best Investment the Board Ever Made"

Mr. Addison Hewlett, Chairman of the Board of Commissioners of New Hanover County, N. C., writes, under date of July 25, 1921:

"We have been using Tarvia for surface treating the macadam roads of New Hanover County for the past six years, and we find this treatment satisfactory in every respect.

"Before we started the use of Tarvia we had great difficulty in maintaining our roads, as they became very dusty in dry weather and washed away in wet weather, leaving our road surface full of holes and ruts. Since using Tarvia the surface of the road has been well protected in all kinds of weather, and today our roads have smooth, hard surfaces and our maintenance problem has been very easily solved. The Tarvia treatment is very inexpensive.

"It is unquestionably the best investment the Board of Commissioners has ever made and the Commissioners would not consider for a moment discontinuing Tarvia on our roads."

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"These Tarvia treatments have cost us in the neighborhood of $300 per mile per year and have proved to be the best, easiest and cheapest method of maintaining our roads. We have always had the best of co-operation from your engineers . . . . .

"We feel that we have a finer system of roads than any other county in the State."

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VOL. 51. No. 24
Entered as second-class matter at the Post Office, at New York, N. Y., November 22, 1921 under the Act of March 3, 1879.
Published weekly by PUBLIC WORKS JOURNAL CORPORATION, 243 W. 39th St., New York, N. Y.
Subscription price $3.00 a year, single copies 10 cents.

PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Vol. 51 DECEMBER 10, 1921 No. 24

Constructing the Duncannon Highway

Eight miles of Pennsylvania State Route No. 195, built in 1920-21 on old location, including widened rock cut in hillside. Excavation with blasting, steam shovel and machine graders. Pneumatic drills sometimes operated from tall ladders. Valley side of road extended by fill hauled in trucks from steam shovel in borrow pit. Imported aggregate unloaded from railroad cars to storage piles over loading tunnel beyond end of route and delivered by relay trains on 8-mile industrial track.

Section 1, of Route 195, of the Pennsylvania State Highway system, is a portion of the Duncannon Highway, 7.93 miles long, from Clarks' Ferry bridge on the Susquehanna river 18 miles northwest of Harrisburg, in Perry county, to Girtys Notch. It is located part of the way on a narrow shelf, excavated on the side of Blue mountain, close to the bank of an old and now disused feeder canal. It passes through a picturesquue and sparsely settled country where there is little local traffic at present, but where there will be a large amount of automobile traffic and trucking over the trunk line of which this route forms a portion.

The road is being built under a $480,000 contract awarded in 1920 by the State Highway Department, Lewis S. Sadler, commissioner, to McArthur Bros., of New York. Thomas Dixon is superintendent for the contractor and George P. Searight is district engineer for the state.

The alignment is nearly all an old location modified by widening the roadbed and improving grades and curves. On this is laid a new reinforced concrete pavement 18 feet wide, 6 inches thick at the edges and 8 inches thick in the center. The 1:2:3 concrete is made with stone 5/8 inch to 2¾ inches in diameter, reinforced with a single thickness of galvanized steel mesh weighing 25 pounds per 100 square feet. The maximum grades are 5 per cent and the sharpest curves have a radius of 360 feet and are built without banking except two curves which have a radius of 140 feet and which are widened and banked.

There are nine concrete bridges with spans of 4 to 12 feet, including one 4-foot and one 6-foot arch, the others being flat slab or girder construction. The numerous culverts are of hub and spigot reinforced concrete pipe from 12 to 30 inches in diameter, which are cast at the manufacturer's yard, delivered by rail and set in concrete walls at both ends. The principal quantities include 19,000 yards of unclassified excavation, 24,000 yards of fill and embankment, and 84,000 square yards of concrete pavement, besides the bridges, culverts and rails and other items. The unit price for the pavement was $4.00 per square yard and the total amount of the contract computed on the estimated unit quantities is $481,784.55.

EXCAVATION AND GRADING

During construction all traffic was detoured and all operations were carried on progressively from the south to the north end of the route and were served by a 24-inch Koppel industrial track about 8 miles long laid from the storage yards on the opposite side of the Juniata river to Clarks Ferry bridge as fast as subgrade was advanced.

For about 2½ miles the road is located on a terrace in the steep, rocky banks of the Blue mountain along the side of the narrow wooded valley and close to a narrow canal with water level from 10 to 30 feet below the road level.

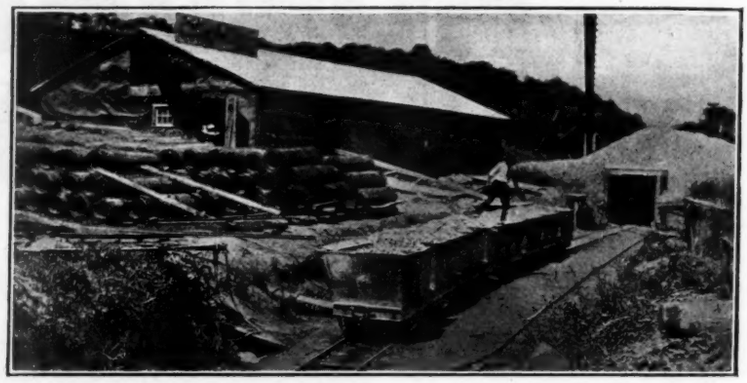
The industrial track was laid on the 5-foot shoulder of the up-hill side of the roadway, and the downhill side of the roadway was widened in places by rock fills, provided by adjacent cuttings and in other places

by earth fills, excavated by an Osgood steam shovel with a 5/8-yard bucket delivering directly to motor trucks.

The rock formation was chiefly shale and limestone in very irregular stratifications and the face of the cut varied from nearly vertical to a slope of 1 on 10. Most of these excavations consisted of trimming the steep slope to an average depth of about 2 feet to remove all projecting and loose or decayed rock and give abundant clearance for the shoulder and for the industrial trains operated there. The height of the cut varied up to 30 feet. The rock was shattered by blasting with 60 percent dynamite cartridges, exploded by electric batteries in holes from 2 to 5 feet deep, drilled with jackhammers often operated by men equipped with safety lines or working from the tops of ladders. The light charges only loosened the rock or tumbled it down to the bottom of the slope, where it was often wheeled across the road and dumped on the downhill face of the embankment to widen the roadway, or was loaded into horsedrawn carts and hauled a short distance to spoil banks or fills.

In two places the rock cut was eliminated by an offset of the alignment introduced to preserve the existing contours of the mountain side, which bore fancied resemblances to the profiles of the former German Kaiser Wilhelm and of the earlier local marauder Girty, from which the two localities were named respectively Dutchman's Face and Girty's Notch, and had become historical landmarks that were preserved by carrying the road out around them at the expense of an encoachment of about 3 feet into the canal.

The maximum fill of 6 feet was made with spoil excavated in the borrow pit. Most of the grading was accomplished with a Western grader, having a 6-foot blade. The light excavation was done by hand, and by scrapers with a gang of 9 men besides the operator of two Buffalo-Pitt steam rollers and a Western Grader Company's scarifier, that broke up the old road surface. The bridge and culvert gangs followed the excavating and grading gangs and were equipped with a 1-bag portable Rex paving machine for mixing the small quantities of concrete required for the culvert end walls. The concrete for the bridges was mixed in a 2-bag Koppel machine.



AGGREGATE, CEMENT, AND REINFORCEMENT STORAGE IN CONTRACTOR'S YARD

UNLOADING AND STORING

The construction materials included about 32,000 barrels of cement from the Pennsylvania Portland Cement Co., in Nazareth; 20,000 tons of stone from J. E. Baker, New Holland, Pa.; 9,700 yards of sand from the Defrain Sand Co., Philadelphia, and the steel reinforcement fabric, all delivered on the Pennsylvania Railroad to the contractor's siding about 500 feet long and 1,000 feet beyond the south end of the route.

The cars were unloaded by a clamshell bucket operated by a guy derrick that deposited the sand and stone in storage piles over an 8- x 8-foot timber tunnel 160 feet long, built with bents of 7- x 9-inch timber 4 feet apart on centers and having in the flat roof four horizontal sliding gates for delivering stone, and four for delivering sand to Koppel steel batch boxes on flat cars on the industrial track that passed through the tunnel, alongside a cement storage house that had a capacity of 15,000 bags (5 cars), crossed the Juniata river on a single-track bridge 750 feet long and thence continued along the shoulder of the highway to the farther end of the contract section.

BUILDING UP OUTER SLOPE WITH ROCK BLASTED FROM FACE OF SIDE HILL CUT

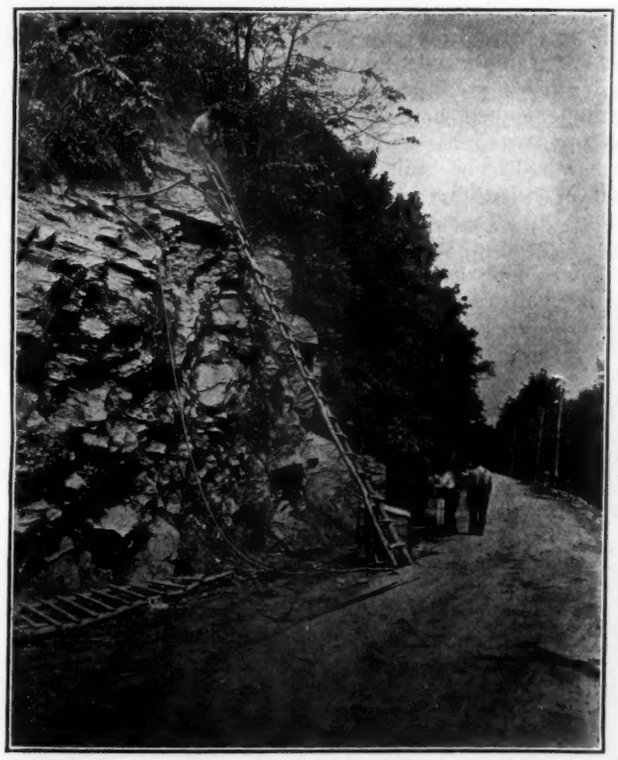
The rolls of reinforcement fabric were stored adjacent to the cement house and nearby were piled 10-foot sections of industrial track that were transported to the advancing end of the finished subgrade on the flat cars used for handling the batch boxes. The piles of track 10 feet high were secured to the cars by a vertical bolt at the center, making the topheavy mass so secure that it was transported safely by the small cars over the rough road bed. Ordinarily about three 30-ton cars of broken stone, two of sand and one of cement were delivered daily and the sand and stone discharged from bottom-dump cars to track pits from which the aggregate was transferred to the storage over the tunnel roof as before described by the clam shell and derrick system.

Ordinarily the bags of cement were unloaded directly from the car door to the batch boxes on the industrial cars alongside, any excess being placed in the store house for reserve. The capacity of the siding was six cars of aggregate and three cars of cement, but as a safety precaution, additional cars were generally held in the railroad company's storage yard, thus incurring some demurrage charges that would have been avoided if it had been practicable to establish a longer siding for the contractor. Generally about 1,000 tons of broken stone and 500 tons of sand were maintained in storage over the tunnel roof.

In the storage yard there were ordinarily employed three men unloading the railroad cars, one man loading cement, one loading sand and one loading stone into the batch boxes, one man directing cars in tunnel, two men carrying cement bags, one derrick man, one oiler, and one foreman. The cement bags were shaken and baled during intervals between material trains, which were run on a headway of about 25 minutes.

HAULING MATERIALS

Two batch boxes were loaded on each flat car and eight cars were run to a train. The trains were hauled by four Whitcomb and two Plymouth locomotives, all of them driven by gasoline. Two of the locomotives were usually held in reserve and four were in constant operation hauling trains that made the round trips in about 1½ hours. The haul was divided into four divisions of different lengths according to the grade, and it was found that better results were obtained by changing locomotives at each division. The first division, including the long bridge, had the steepest grade and it was the shortest because the locomotive could only haul four-car trains, and therefore were required to make twice as many trips as on the other divisions where the trains were made up of 8 cars for16 batches of aggregate. The running time of loaded train hauled over all four divisions was about 40 minutes, the return time was about the same, and a few additional minutes were required for loading and shifting in the storage yards.



TRIMMING FACE OF DEEP SIDE HILL CUT

The full cars were run opposite the mixer on the main line of the industrial track which extended several hundred feet beyond the mixer in the end of the subgrade. As fast as the cars were unloaded by the mixer derrick, the empties were pulled back a short distance toward the storage yard and switched to a siding, where they were made up into a train and returned to the storage yards as soon as a new train pulled in and occupied the space adjacent to the mixer.

(To be continued)

Minor Repairs to Sheet Asphalt

An appliance adapted especially to making minor repairs to sheet asphalt pavements in cities too small to support a permanent asphalt plant is something greatly to be desired, in the opinion of August E. Christhilf, highways engineer of Baltimore, expressed in a paper before the A.S.M.I. He thinks that the burners or heaters of the Luten type are not adaptable to this work, while the usual method of cutting out, concreting and hauling hot stuff for a number of miles, during which it cools in the wagon or truck, is not efficient. Cuts made in sheet asphalt are generally so small in area and so widely distributed as to make the cost high and the work unattractive to a contractor. Contractors will not generally start a plant in operation until enough yardage of patches has accumulated to make it worth while.

The author suggests as desirable a small outfit on wheels containing a burner to supply the necessary heat, with compartments to heat and keep warm the necessary paving mixtures. He did not think it practicable to actually perform the mixing on the street, but if mixed at a larger plant and delivered to the street outfit it could be kept hot until all of it had been used. Or a mixure could be made and stored in loose piles, and when needed the loose mixture could be heated in the outfit and used for emergency repairs. Such an outfit could contain compartments for hot asphalt cement, top mixture, heating irons, and a bin for portland cement.

He did not think it practicable to heat the several materials separately and mix them on the job, as the making of such a mixture is an exact operation and should be done by men trained in that particular work. If done on the street by repair men it is more than probable that the result would be unstable mixtures that would soon shove and leave the pavement in as bad condition as before the patch was made.

With a load of topping in such a heater, the patch gang could work full time, moving from cut to cut. There would be no necessity for using binder in these patches, as the pavements patched are usually worn so thin that, if binders were used, the wearing surface would be too thin; moreover it is much more

difficult to get a good joint when using binder than with topping alone.

"Such an outfit would be particularly useful in small towns where they have an area of asphalt laid by contract and where there is not enough business to support an asphalt plant. I have seen many instances of this kind where the sheet asphalt pavements are going to pieces for want of attention and the towns are not able to get a contractor to bring in a plant for the small area involved. In such cases patches are usually made with stone and poured with bitumen, or are filled with cold patch mixture, both methods being inefficient and tending to ruin what might be a good pavement."

The author was in doubt whether this outfit should be self-propelling but inclined to the belief that it should be arranged to be attached behind a truck and hauled by it from one location to another or else by a team; the truck, if used, serving the heater with hot material. He suggested a capacity of not more than one ton of hot mixture. The chief object in view is to allow cuts to be closed up promptly and patches made as soon as needed, since the convenience of the public is of the first importance in the city work.

Highway Construction in the United States

The enormous importance of highway construction is forcibly illustrated by the statements recently made by the American Road Builders' Association concerning the number of contractors and others directly interested in such work, the present and future expenditures on new roads and the cost of material and equipment involved.

There are now identified with the road industry 80,000 public officials, 7,000 road contractors, 2,000 bridge contractors, 1,196 manufacturers and dealers in road building machinery and materials, 7,338 firms manufacturing highway transportation equipment, 25,000 civil, highway and chemical engineers and 842 national, state and local highway associations and engineers' and contractors' organizations.

There are 206 firms manufacturing Portland cement for road building, with an annual output of 125,000,000 barrels valued at $375,000,000; 127 firms manufacturing brick valued annually at $7,145,000; 46 wooden paving block manufacturers with output of 59,000,000 blocks valued at $4,000,800; 23 manufacturers of granite paving blocks with output of 26,000,000 blocks valued at $1,547,000; 380 dealers in crushed stone with an output of 9,700,000 tons for road purposes valued at $9,500,000; 42 asphalt manufacturers with production of 1,000,487 tons valued at $44,610,000, and 345 firms producing 23,000,000 tons of sand and gravel of a total value of $13,000,000. The combined capital investments of these 1,069 nrms is $558,060,000.

In addition to these there are 7,338 firms manufacturing trucks, tractors, automobiles and other vehicles dependent upon good roads and having a total capital invested amounting to $6,000,000, an amount exceeding one-third the capital of the country's railroads.

In 1919 approximately $400,000,000 was spent on road construction in this country; in 1920 about $600,000,000, and it is estimated that for 1921 approximately $800,000,000 will have been spent. For next year nearly $1,500,000,000 are available for road construction and it is expected that actual cash expenditures will pass the billion dollar mark. More money is now being spent on road construction than on all other public works combined.

Rapid Highway Bridge Work

By H. D. WILLIAR, JR.*

Maryland has 1,700 miles of improved State highways on which there are a number of one way bridges. Most of them are Pony Truss, from 12 to 14 feet wide, with 25 to 125-foot spans. All of these bridges were constructed some years ago when traffic was light and slow-moving, and at that time were entirely adequate.

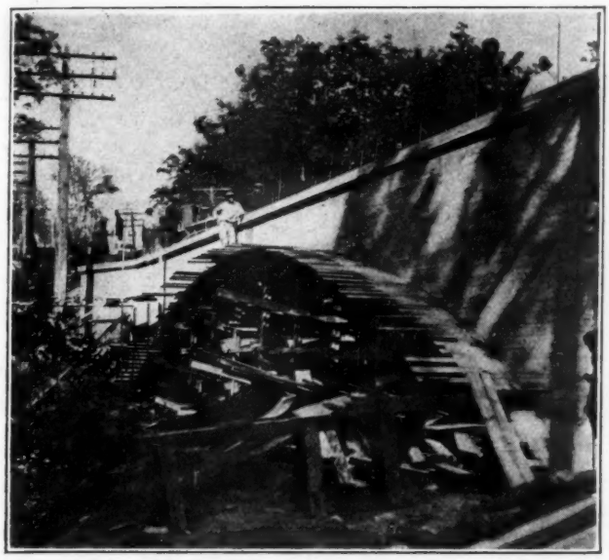
The State Roads Commission, since its inception in 1908, has replaced these bridges with modern two-way concrete structures as rapidly as circumstances demanded and as finances permitted, until at present there are but 48 narrow bridges on the State System.

Notwithstanding the fact that all of these danger points are posted "One Way Bridge," with large signs 250 feet away from each end of the bridge, they are frequently the scenes of accidents. Fast-moving traffic, willing to take a chance, often gets jammed on these bridges, resulting not only in serious injury to life and cars but in some cases completely wrecking the bridge. In instances where the bridge is damaged, immediate and quick action is necessary on the part of the State Roads Commission to make repairs with the least interruption or inconvenience to the travelling public. It may be that minor repairs are all that is necessary; in other cases, abutments have to be underpinned, or timber bents constructed at weakened panel points, while in one instance an entire new bridge had to be built. It was in building this bridge that Maryland set a record for rapid highway work.

On the Washington-Baltimore Boulevard, at Savage, Maryland, there was a pin connected steel bridge 101 feet long over the Little Patuxent River. This bridge had a height of 18 feet and a driveway of 13 feet and was posted on each side "One Way Bridge." Despite this fact, a 5-ton truck, loaded with asphalt,

*Assistant Chief Engineer, Maryland State Roads Commission.

RUINS OF PIN-CONNECTED STEEL TRUSS SPAN



BRIDGE COMPLETED, WITH FALSEWORK AND CENTERING STILL IN POSITION

tried to pass a Dodge roadster on the bridge with the result that the two sideswiped and the truck was thrown through the side of the bridge, knocking out a number of vertical and diagonal members. Naturally, the bridge collapsed and settled down in the river. This was at 7.00 A.M.—September 21, 1921.

The State Roads Commission in session, authorized the Chief Engineer to enter into a contract for the immediate building of a new reinforced concrete arch at this point. This was on September 22nd.

Plans were prepared, three bids received, and the contract for the bridge to be completed within 30 working days was awarded to the Luten Bridge Company of York, Pennsylvania, at their bid of $19,000. This was on September 24th.

One crew of men with acetylene torches and one with block and tackle started to dismantel the old bridge on September 24th and had the site entirely cleared by September 25th.

The plans called for a 24-foot roadway reinforced concrete arch with a span of 97 feet and a rise of 18 feet. The contractor started work on September 26th.

NEW BRIDGE IN SERVICE WITH FALSEWORK STILL IN POSITION UNDER ARCH

While the excavating for the abutments was being done, another force of men was erecting the centers, so that on October 6th the two abutments were poured. The arch was poured in two rings and on October 10th the pouring of the up-stream ring started. On October 12th, both rings were completed. The first spandrel wall was completely concreted on October 15th, the second started on October 17th. Backfilling began on October 19th and traffic was turned over the bridge at noon on October 22nd.

Highway Construction in Wisconsin.

A. R. Hirst, Wisconsin State Highway Engineer, says that "this year there will have been expended in all types of road and bridge construction in Wisconsin approximately $24,000,000. In addition there will have been expended approximately $500,000 for machinery and for gravel pits and stone quarries, the cost of which is not included in the construction item.

"There will have been expended approximately $4,000,000 for the maintenance of state trunk highways, county trunk highways and state aid roads. In addition there will have been expended about $750,000 for state, county and federal supervision, not charged as a part of the cost of the above work.

"There have been built about 340 miles of concrete road, about 1,100 miles of gravel surufacing, about 100 miles of miscellaneous surfacing, and about 1,000 miles graded but not surfaced, making about 2,540 miles of all construction.

"There have been maintained 7,500 miles of state trunk highways, and the counties have maintained about 5,000 miles of county highways.

"Out of the maintenance funds there will have been surfaced with various materials, largely gravel, about 250 miles of road, and there will have been re-graded under gang maintenance methods (that is, heavy road machine work) about 50 miles, so that in addition to building to standards the 2,540 miles stated above, we have materially improved the condition of 1,200 miles with maintenance funds, making a total of 3,740 miles of road which has suffered some change for the better in its condition as a result of this year's work outside of the results gained from the maintenance."

Use for the Old Erie Canal.

In constructing the new Erie ship canal, the location of the old and smaller canal was followed where possible, but considerable stretches of it were abandoned for locations more favorable to the larger canal. Most of these stretches remain in the possession of the state, but are offered for purchase by cities or other political units in which they are situated. The city of Rochester is expecting to purchase eight miles of the canal that lie within its limits, title to pass on December 21st of this year. The use to be made of the canal has not, we believe, been officially settled upon, but the city contemplates building a subway from Oak street to South avenue and the construction of an electric railroad in the bed of the canal linking up the other roads and giving access to the center of the city for suburban cars. It will pay for the canal by means of a bond issue. It is hoped to begin work on the actual construction for utilizing the canal early next spring.

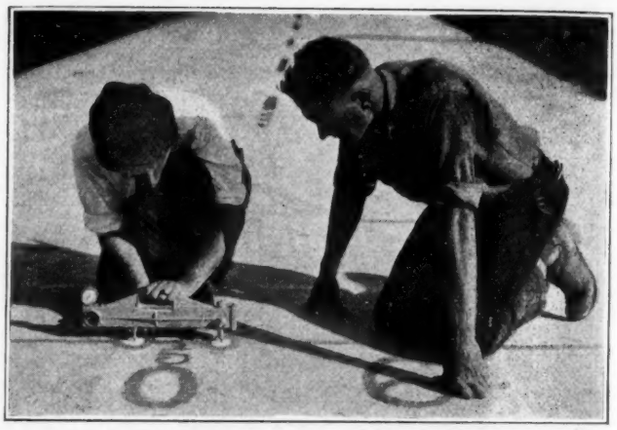
The Pittsburgh Test Highway

Some of the observations made and figures obtained in test of concrete road described in our issue of October 29th.

Test operations were begun during November on the Pittsburg, California, test highway described in our issue of October 29. On November 9th forty motor trucks began an endurance run on the highway, but previous to this two trucks had been used in making various tests which could not well be made after the endurance run had started.

These preliminary tests includued a moving load test, a static load test and an impact load test. In making the impact test, planks of different thicknesses were placed across the track directly over the roof of the observation tunnel, and the motor truck was driven over these planks. Impact tests were made with ½-inch fall, 1-inch, 1½-inch and 2-inch fall. The truck was loaded with pig iron giving a total weight of 14,500 pounds. Nine steel rods extend from the concrete road slab into the observation tunnel, these rods being set in a line at intervals of 2 feet at right angles to the line of the road. The slab here is 6 inches thick and reinforced with 3/8-inch steel bars placed in the top and bottom of the slab diagonally 9 inches on centers. The lower end of each rod operates a recording pen which makes a permanent record of the slab deflection on a traveling record sheet. In addition to these pens, Ames dials were installed in the tunnel, one for each rod, which registered the slab deflection in thousandths of an inch. When the observations are being taken, one man is stationed at each dial to note the registration on his particular dial and these figures are later taken to the office and recorded.

When the truck passed over a plank giving a 2-inch fall, the truck wheels being 17 inches and 7 feet respectively from the edge of the road, the pavement under the outside truck wheels deflected .035 inch and the pavement under the inside truck wheels deflected .017 inch. At 2 feet inside the inside wheel the deflection was about .012, at 4 feet it was about .003, and about .001 at 6 feet from the inner wheel. When the fall was only half an inch, the deflection under the outer wheel was about .018, under the inner wheel it was about .007 and 4 feet from the inner wheel was about .001 The static deflection for the same truck was .008 under the outer wheel, .003 under the inner wheel and .001 four feet to the right of the inner wheel.

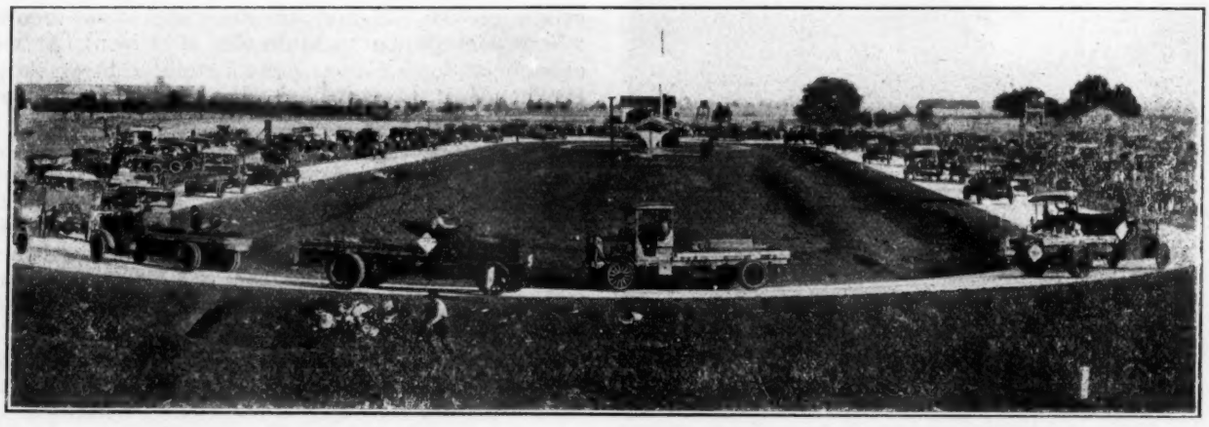


MEASURING FLEXURE BY MEANS OF EXTENSOMETER

The curve of deflection under the static load was practically a straight line from the edge of the road to a point 4 feet inside the inner wheel. Under a moving load the deflections were a very small amount less than under a static load. But, under both moving load and impact loads the deflection was less between the two wheels than it was at the inner wheel and considerably less than at the outer wheel. This impact test was assumed to simulate the effect of a tire in bad condition, and a badly broken tire was run over the road and the records taken as above.

The moving load test was taken with a truck traveling at 12 miles an hour and indicated that at this rate the deflection and therefore the stress on the slab was less than with a truck standing still.

Under a moving load the rod on the outside of the pavement noted a deflection when the front wheel of the approaching truck was still about 6 feet from the line of the rods, and became .004 when the front wheel was directly over the rod. As the front wheel passed on, the rod rose slightly to de-



FORTY MOTOR TRUCKS MAKING PAVEMENT ENDURANCE RUN ON TEST HIGHWAY

MEASURING EXPANSION DUE TO OPENING OF CRACK

TAKING TEMPERATURE OF CONCRETE

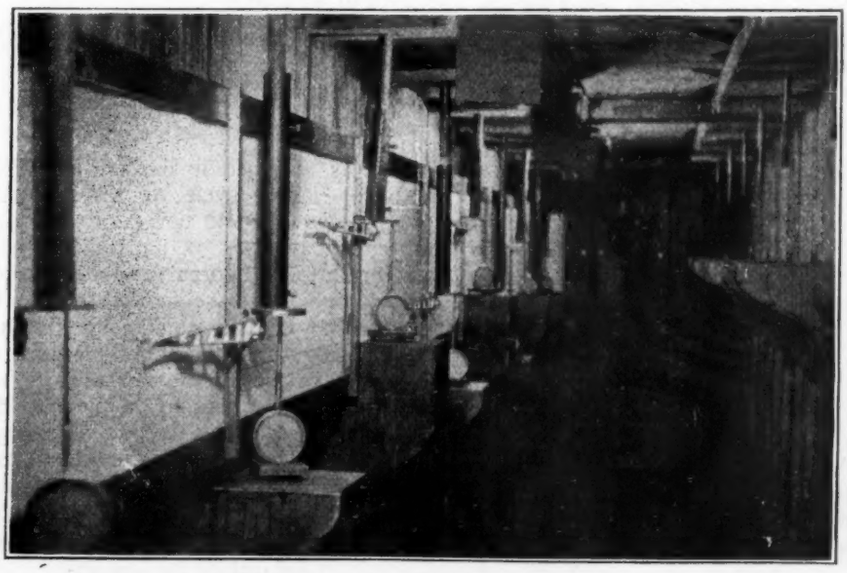
flection .002 and then fell rapidly to .008 as the rear wheel came over the line of rods. The same effect, but relatively less, was noted in all of the rods on the same side of the road as the truck, the one 2 feet inside of the inside wheel returning to approximately zero deflection after the front wheel had passed and before the rear wheel reached the line of rods.

In making the test for deflection under an approaching load, the pavement both sides of the observation tunnel was marked off into foot sections for 25 foot each way. The loaded motor truck was then run slowly toward the tunnel, stopping every two feet to permit the dials to be read for each position. The wheel base of the truck was 13 feet 4 inches. The rods did not return to zero deflection until the rear wheels of the truck had traveled to a point 40 feet beyond the tunnel, although they had not indicated any deflection until these wheels were within about 23 feet of the tunnel on approaching.

The various cracks in the pavement are charted as they develop, a separate chart being provided for each section of pavement. Each day the cracks that then appear in the pavement are entered on the proper chart. By this means the development of each crack is recorded. One interesting fact is that up to the present time no longitudinal cracks have appeared in any of the reinforced sections but they have appeared in sections that are not reinforced.

At one section 150 feet long deflections due to temperature are measured by Ames dials, these measurements being taken at 6 foot intervals on each side of the road, steel rods being driven deep into the earth at the points where the dials are to be used.

Temperature of the concrete in the road bed is taken by a method out of the ordinary. Holes have been bored in each of the 13 sections of pavement. At each point, one hole extends to near the bottom of the pavement, one to the mid-depth of the pavement and a third to a short distance below the surface. These holes were swabbed with a waterproof lining to make them waterproof and a quantity of mercury



INTERIOR OF AN OBSERVATION TUNNEL
Along the left wall is the traveling record sheet, on which the deflections of the pavement above, multiplied several times, are recorded by pens actuated by nine vertical rods embedded in the concrete. At the bottom of each rod is an Ames dial that register deflec-tions to thousandths of an inch.

TIRE USED IN MAKING IMPACT TEST

TAKING BORING SAMPLES OF SUBGRADE

placed in each hole, which was then plugged with a cork. In taking the temperature, the operator removes the cork and inserts a thermometer in the mercury at the bottom of the hole. The thermometer remains in the mercury for one minute, at the end of which time the temperature that it registers is recorded. Thus the temperature at the bottom, middle and top of the slab at this point are obtained. This system is considered to be much preferable to that of burying thermometers in the concrete. The mercury in the holes acquires the same temperature as the concrete surrounding it and imparts this to the bulb of the thermometer.

Borings are taken from the subgrade at intervals to determine the condition of the soil as to water content, etc. Holes were provided in the concrete for making these borings, which are kept plugged with wooden plugs except when borings are being made.

Road Work by Reformatory Inmates

In the spring of this year the state highway commission of New Jersey entered into an agreement with the board of managers and the superintendent of the New Jersey reformatory at Rahway to use some of the young men from the reformatory for road work in Morris county. Work was begun in April with a gang of 50, which had increased to 98 by May 3rd, but at no time after that exceeded 94. The young men worked on all sections of the road, many times miles away from the officers and alone. There were no complaints from the residents of the section in which they were working as to their conduct and in fact their deportment was commented upon favorably. Only six of the entire number attempted to escape and four of these were later returned. The road built by them is of concrete approximately four miles long and 20 feet wide, with graded shoulders. The concrete is reinforced, 8 inches thick in the center and 6 inches on the side. The men also did considerable guard rail work.

Human Factors in Operating Sewage Treatment Plants*

By JOHN H. DUNLAP†

Most failures of plants are due to operation, and very few plants are operated by competent men. The author suggests that state health boards require weekly reports by operators and expert supervision.

With proper design and construction of sewage treatment plants assumed, their operation resolves itself into two problems, first, the problem of the control of the biological factors involved; and second, the control of the human factors involved. As here used, the phrase "biological factors" is intended to include the activities both of vegetable and of animal organisms.

The general relation between bacteria and organic decomposition is one of the most important in the marvelous workshop of nature. Were it not for the steady fidelity of bacteria to nature's laws, this world would in a short time become uninhabitable for human beings. Organic matter would become piled mountain high, all those processes would cease by which organic matter is returned to mother earth to begin again the never-ending cycle of transformation, and life as we know it would perish.

Whenever the biological laws of nature, providing for the transformation of organic matter into harmless mineral compounds, are interfered with by man, disaster results. Usually this is the fundamental reason why our sewage treatment plants are doing unsatisfactory work. Bacteria can always be relied upon to conform to law, and to do their work with unceasing fidelity. Mankind alone, of all living beings on the earth, cannot be relied upon to perform his part in the world of nature. Mankind alone, through the exercise of his power of choice, may or may not react to the needs of the hour in a logical manner.

This human phenomenon is so marked that it has led Harrington Emerson, the noted efficiency expert, to remark: 'You can trust a dog, a horse and animals,

*Slightly condensed from a paper at the Third Conference on the Operation of Sewage Treatment Plants, held at Iowa State College, Ames, Iowa, October 26-28.

†Professor of Hydraulics and Sanitary Engineering, University of Iowa, Iowa City, Iowa.

but when it comes to the human being you must count on his doing the wrong thing."‡

In contrast with this, we have to confess that bacteria may be relied upon to do the right thing. This same fact is well expressed by the motto which Edison is said to keep on his desk: "There is no expedient that men will not adopt to avoid thinking."

Bacteria, on the other hand, adopt no expedients in order to avoid duty. They react to enviroment in complete harmony with the laws of nature.

THE HUMAN FACTORS

The tendency of mankind to do the wrong thing, and to avoid thinking, is demonstrated forcibly in the operation of sewage treatment plants. In fact, the chief failures in operation are usually human failures. Doctor Thresh, Medical Officer of Health for the County of Essex, England, in an address before the Association of Managers of Sewage Disposal Works, once made a statement somewhat as follows:

"I have so repeatedly seen excellent works give bad results on account of inefficient management, and very defective works give fair results on account of the efficiency of the manager, that I have come to regard the manager as being even more important than the works."†

In this connection the writer must confess that he has visited scores of sewage treatment plants, at one time or another, and has yet to find a plant which was not laboring under difficulties, usually of inefficient management. In making this statement, it would not be fair to place all the blame upon the men who are theoretically in direct charge of operation of these plants. Usually the cause is farther back and may be located only by an anlysis of our inefficient American plan of city and town government. The conduct of the business of our cities and towns is, by our American system, placed each biennium, for the most part, in the hands of new and untried men, quite unacquainted with the city's business as a whole, and perhaps, failing to understand most disastrously of all, such a complicated machine as a sewage treatment plant. The common mistake made is to conclude that the sewage treatment plant is automatic, and therefore needs little or no attention. Accordingly some individual like the water works superintendent, or the chief of police, or the city clerk, or some one who already has more to do than he can do, is assigned the task of operating the sewage treatment plant. Naturally, under these conditions the plant is neglected.

‡Harrington Emerson: Long Hours and Low Pay; Short Hours and High Pay. Business Crucible, July-August, 1921, p. 5.

†Francis E. Daniels: Operation of Sewage Disposal Plants, page 1.

THE SITUATION THROUGHOUT THE UNITED STATES

In order to ascertain how far the human factor involved in the operation of sewage treatment plants was performing its share of the work, a letter was sent to the sanitary engineers of the State Board of Health of each of our forty-eight states. The letter requested an outline of the law, or of the rules, followed in the control of the operation of sewage treatment plants.

Forty-one replies to the forty-eight letters were received. Judging from these forty-one replies, apparently only eighteen states are now requiring the submission and approval of plans for sewage treatment plants by the State Board of Health. Only five states are requiring monthly reports, namely, West Virginia, Michigan, Kansas, New Jersey and Ohio. Only one is requiring licensed operators, namely, New Jersey.

The impression from reading these letters is that the general situation is very unsatisfactory. For instance, in the third annual report of the Department of Public Health of the State of Illinois for the period from July 1, 1919, to June 30, 1920, on page 63, the following statement occurs:

(To be printed on a postal card)

WEEKLY OPERATION REPORT OF THE SEWAGE TREATMENT PLANT

At ..... For the Week Ending..... Submitted by .....

	Sewage by-passed	Counter		Tanks..... (Cameron or Imhoff Sludge Settling			solids	Filters ..... (Sand, Sprinkling or Contact)		Outlet into (Name of creek, river etc.)	Hours spent at plant
Day	Hours	Reading	Time	Depth	Removed	Inf	Eff.	Condition	Effluent Stability	Stability	
	1	2	3	4	5	6	7	8	9	10	11
M.											
T.											
W.											
T.											
F.											
S.											

12. Remarks .....

WHAT TO RECORD (To be placed on the left half of the front side of the postal card.

Col. No.

1. Length of time in hours sewage was bypassed. Under remarks state reason.
2. Reading of counter in siphon chamber.
3. Exact time at which reading is taken.
4. Measure depth of sludge in tanks at several points and record average depth.
5. Cubic feet of sludge run out, computed from dimensions of sludge bed.
6. Find c.c. of settling solids in 1 hour from influent. See directions for tests.
7. Find c.c. of settling solids in 1 hour from effluent. See directions for tests.
8. Condition as to surface mat, pooling, evenness of distribution of sewage, etc.
9. Number of days' retention of blue color. See directions for tests.
10. Collect sample about 100 feet below outlet and record days' retention of blue color.
11. Record the number of hours spent in work at the plant.
12. Under remarks state any work done not included in columns, 1-11, such as removal of sludge from sludge bed, etc.

"Experience has shown that there is a strong tendency among municipalities to neglect the operation of sewage treatment plants. It is a common, fallacious idea that sewage treatment works require little or no attention, and consequently, they are neglected until objectionable conditions prevail because of odors from the plant or because of stream pollution. Some sewage treatment plants have been so neglected that they have become permanently damaged and can be put back into operating condition only at considerable expense."

A SUGGESTED WAY OUT

The way out from this inefficiency and this waste of investment in sewage treatment plants will consist of three steps, each of which, though perhaps difficult to take, is necessary if a suitable return is to be made upon the large investments now required in sewage treatment plants.

In the first place it is believed that the State Board of Health should require the operator of every sewage treatment plant in the state to render a weekly report of daily operation. A form for such a weekly report is suggested herewith. This form can be printed upon one side of an ordinary size postal card, and when filled out at the end of each week, mailed to the sanitary engineer of the State Board of Health. On the address side of the post card should be printed the address of the sanitary engineer of the State Board of Health, and then upon the left half of the front side can be printed certain directions as to what to record in each column.

It is believed that there are many advantages to be secured by requiring a weekly, rather than a monthly report from Iowa plants. For instance, the report card for a week is small enough so that it may be carried in the pocket of the operator, and filled out on the job when the readings and tests are made. Furthermore, the weekly report will aid in securing daily visits to the plants, and prompt knowledge by the sanitary engineer of the State Board of Health of neglect.

While the suggested form does not go much into detail, it does contain sufficient facts so that the sanitary engineer of the State Board of Health should know when plants are being operated properly. The facts called for are easily obtained. For instance, in Column 1 the number of hours sewage is bypassed on any given day, and the reason for it, should be given in order that the state sanitary engineer may know just how much use is being made of the plant. The writer recently visited an expensive sewage treatment plant at which the sewage had been bypassed for a years' time, due to complete neglect on the part of the city authorities. A threatened law suit alone was able to get the plant put back again into operation, and then, naturally, at considerable expense.

The counter contemplated in columns 2 and 3, is one of the simple devices now on the market, similar to that manufactured by the Pacific Flush-Tank Company, and sold at a cost of $5.

The depth of sludge in the tanks, columns 4 and 5, is an important matter, especially at this season of the year when it must be ascertained whether or not there is enough room in the sludge compartments for the winter's sludge. The tests for settling solids in the influent and the effluent, columns 6 and 7, are simple to make. Imhoff conical settling glasses are used. One glass is filled with the sewage as it enters the tank, and another with sewage as it leaves the tank. At the end of one or of two hours the cubic centimeters of settling solids at the bottoms of the glasses may be read directly from the graduations on the glasses. The average removal of settling solids by Imhoff tanks as shown by these settling glasses, is about 95 per cent.

The condition of the filters, column 8, is of course, an important part of the report, since on the average two-thirds of the organic matter in sewage is in solution, and therefore, must be oxidized by the action of the filters. The test for stability of the effluent, column 9, is very easily made. A sample of the effluent may be caught in a 4-ounce bottle, to which is added the proper proportion of methylene blue, by using an ordinary pipetite. The number of days' retention of blue color, when the sample is kept at room temperature, is then noted. If the sample retains its blue color for four days, no nuisance will be caused by discharging it into an ordinary creek or ditch.

The test for stability of the mixed creek or river water and sewage effluent, column 10, is an important test in case the landowners below the plant should sue the city for damages due to supposed putrescibility of the creek water caused by the addition of sewage. The test is made in a manner similar to that upon the effluent from the filters. Of course full directions for these tests should be made in a small pamphlet to be issued by the State Board of Health.

Naturally column 11, "hours spent at the plant," is one of the most important columns of the report. Under "remarks," at the bottom of the card, should be stated any work done that is not included in columns 1 to 11, such as removal of sludge from the sludge beds, etc.

The second step in the process of placing the operation of treatment plants upon a more scientific basis would be the appointment of a competent sanitary engineer in charge of a plant whenever the weekly operation report, or whenever a personal inspection on the part of the sanitary engineer of the State Board of Health, shows that the plant is not being operated properly. It would not be necessary for the sanitary engineer to devote much time to a given plant. By having copies of the weekly reports sent directly to him as well as to the sanitary engineer of the State Board of Health, and by giving the necessary instructions to the local attendant, proper operation of the plant could be obtained at all seasons of the year.

It is interesting to note that this recommendation was made in the Third Annual Report of the Department of Health of the State of Illinois already referred to. On page 64 of this Report it is recommended:

"The burden of constant control of sewage treatment plants should not be borne by the state, but rather the municipalities should retain competent engineers to make sufficiently frequent examinations to insure proper operation. The state should, of course, supplement the work of these engineers and employees by periodic inspections of the plants at reasonable intervals, to check their operation and give advice which can often be based upon the experiences at other treatment plants."

The third step in securing better operation of Iowa plants would include the preparation of a set of general directions for the operation of the various parts of sewage treatment plants of all types. This set of directions should contain drawings and photographs of the proper tools to be used in carrying out the directions. A description of the tests necessary, such as those for settling solids and stability, should be carefully explained. Furthermore, the State Board of Health might assist in obtaining the necessary equipment for making the tests by furnishing complete lists, stating where the equipment may be purchased, and its cost.

CONCLUSION

The fact that much of the investment in Iowa sewage treatment plants is now a waste of money is to be regretted. Usually the fault is not with the design of the plants, or with the bacteria upon which the transformation of organic matter depends. The reason for this situation is due principally to the human factors involved in the operation of these plants. It is believed that the three steps of requiring weekly reports, operation under charge of competent sanitary engineers where necessary, and the preparation of a carefully prepared set of directions will do much to remedy the present deplorable state of affairs. Of course all this pre-supposes that the Iowa State Board of Health will have funds to finance this extension of its work.

The final question, therefore, again involves the human equation: "Will the state pay the price?" We must not allow ourselves to forget that well-known axiom in the science of public health, propounded by the New York State Department of Health:

"Public health is purchaseable. Within natural limitations any community can determine its own death rate."

Trench Machine Excavates 47,880 Cubic Yards Per Day

A ditch 20 feet deep and 108 inches wide has been excavated in Muncie, Ind., at the rate of 266 linear feet per 10- hour day by the Harris-Andrews-Henderson Co., Youngstown, Ohio. The work was done with an Austin Machinery Corp., trenching machine with multipedal traction operated by an 100-h.p. gasoline engine at a cost of $25.00 per 10-hour day; or at the rate of about $0.0052 per cubic foot.

The machine will dig from 27 to 54 inches in width and to a little more than 20 feet in depth at a speed of about 1 linear foot per minute. In this case the trench was excavated with two cuts each 8 feet 3 inches wide at the rate of 80 cubic feet of earth per minute. In shifting from one cut to the other the boom was raised, the machine moved forward and then back again in approximately 2 minutes.

The spoil was deposited by the automatic conveyor on one side of the trench, leaving the other side free for the delivery, storing and handling of the precast concrete sewer pipe that was installed in the trench. As fast as the second cut was completed by the machine the sides of the trench were sheeted with square edge vertical planks, braced by two or three horizontal sets of adjustable pipe struts engaging two lines of rangers.

Pulverizing House Refuse

An English plant inspected by municipal engineers, and comparisons with existing destructors. Disposal of destructor clinker difficult.

On October 21st the Institution of Municipal and County Engineers of England met at Hampstead and there inspected a pulverizer plant for the conversion of house refuse into fertilizer. The plant comprises two refuse manipulators, each capable of pulverizing about 20 tons of house refuse a day, elevator conveyors for discharging material into railway trucks, counter shafts, motors and other necessary electrical equipment. Each manipulator is operated by a 50 h.p. electric motor, and the elevator conveyor by a 5 h.p. motor. The cost of the plant, electrical equipment and adaptation of buildings, including the pit and the machinery foundations, amounted to 5,000 pounds, the contract being made last year when prices of materials and labor were at the peak.

It is reported that the net cost for conversion of refuse at this plant, including all labor and other operating charges and interest and depreciation, is estimated at about 6 shillings a ton for the current financial year. The plant, with its conversion of 40 tons a day, treats only about half the refuse of the borough and at the present time the authorities are paying about 13 shillings per ton for disposing of the remainder of the untreated refuse to be dumped in the country. A contractor pays the council 9 pence the first year, 1 shilling 6 pence the second year and 2 shillings the third year per ton for the crushed refuse placed in a truck at the plant, the contractor paying all transportation and other charges and finding customers for the fertilizer. It is reported that he has disposed of all the material since last April without difficulty.

Only three men are employed at the plant by the borough, although others were present employed by the contractor, who had the privilege of salvaging the refuse. The refuse is deodorized in passing through the pulverizers. No storage or accumulation is permitted and the odor from the works was said by O. E. Winter to be less than that from any refuse destructor he had ever visited. He suggested that a small furnace would be useful for destroying infected mattresses and some other materials. Hampstead authorities had contemplated a complete salvaging scheme and plans for the same had been prepared three years ago, but the cost was seen to be so excessive that is was abandoned.

The engineers saw the refuse being unloaded from electric refuse collecting trucks, conveyed to the machines, pulverized, and in a very few minutes automatically loaded into railway cars. Referring to the plant afterwards, one of the members stated that, although he had sniffed the converted material and endeavored to find a nuisance at the works, he found no objectionable smell anywhere. Another member stated that his municipality, Sutton, had a pulverizing

plant and that he noticed that, while flies were abundant in the house refuse before treatment, there were none when it left the pulverizers.

Some of the members present made comparisons with destructors used in their own municipalities. W. A. Grieves of Sutton stated his opinion that refuse destructors would not be erected for town refuse in the future, the chief difficulty being that of getting rid of the clinker resulting from the incineration. Capt. Wilkinson, of Tottenham, said that the Hampstead process was much more sanitary than any destructor process he had ever come across, including his own. The net cost of destruction at the Tottenham destructor was 10 shillings. Norman Scorgie, of Hackney, said that the clinker from their destructor was a serious difficulty. They had proposed setting up a plant for making flags or slabs, but found that the capital and labor gave a cost higher than that for making the same slabs of crushed granite.

Rainfall and the San Antonio Flood

Some rainfall and run-off records relative to the flood. Total run-off percentage not high.

In the issue of October 22nd, PUBLIC WORKS gave some information concerning the flood that occurred in San Antonio on September 9th and 10th of this year. No official data concerning rainfall or run-off were available at that time and some startling and almost unbelievable estimates of precipitation were made. In a paper presented before the American Society of Civil Engineers by C. T. Bartlett, a consulting engineer of San Antonio, more definite and reliable data have been given, from which the following statements are obtained.

Prior to the storm the country in the vicinity of San Antonio had been quite dry and practically no water was flowing in the several creeks. In fact Alazan and Apache creeks are dry arroyos. The soaking rain of September 8th entirely disappeared and no run-off occurred, and very little from the rain of the 9th until the electrical storm at 6 p. m. Even this storm did not produce as high a percentage of run-off as would have been expected from an eastern shed, owing to the continued absorption in the soil in the water shed and also by the rapid absorption of that which overflowed the banks of the streams within and just above the city limits.

According to the rainfall records that were available, about one-third of which were secured by standard rain gages and one quarter by measurements in straight-sided cans taken by farmers who keep more or less regular records, "the greatest intensities in the San Antonio storm were between 6 p. m. and 11:30 p. m. During these 5½ hours the rainfall ranged from 1.56 inches at the San Antonio weather bureau to 3.5 inches, 4.5 inches, 6.2 inches and possibly as high as 15 inches at various points. The average on the water shed for this 5½ hours has been placed at 6.5 inches.

"The Engineering Corps of the writer's firm has made a hydrographic survey, as careful as circumstances permitted, of the slopes and areas of the flood crest at various points. It appears that ½ mile above the city limits, the flood peak in the Olmos was between 31,000 sec-ft. as a minimum, and 39,000 sec-ft. as a maximum, from 32.4 sq. miles. This represents from 960 to 1,200 sec-ft. per square mile. The peak discharge at the center of the city is estimated at 23,700 sec-ft., or 580 sec-ft. per square mile from 41 sq. miles. Below the center of the city, 1½ miles, the crest is estimated at 15,000 sec-ft., or 333 sec-ft. per square mile from 45 sq. miles.

"One feature of the flood that will be difficult for Eastern engineers to understand is the comparatively small run-off. Above the city, the Olmos was not out of its banks more than six hours, the crest falling almost immediately. The flow increased from about 4,000 to 35,000 sec-ft. and fell again to 4,000 sec-ft. in six hours. At the center of the city, the flow ranged from 4,000 to 23,700 sec-ft. and back to 4,000 sec-ft., in about eleven hours.

"From unofficial gaugings taken by the U. S. Geological Survey, on the day following the flood, and by gaugings of the water-stage register, and from other data, a rough computation has been made of the run-off for the storm for a period of 7 days, which indicates that it did not exceed 10,000 acre-ft. from an area of 42 sq. miles above the station. All the storm flow had practically run off within the period of one week.

"This estimated run-off of 10,000 acre-ft. is 35.4% of the depth of rainfall for the entire storm. However, by far the greater portion of this run-off was from 32.4 sq. miles above the city. It is probable, in fact, that the run-off was as great from the upper basin as from the entire basin, the absorption of flood-waters by gravel beds in the lower valley probably amounting to as much as the run-off from the lighter rain on the lower 9 sq. miles within the city.

"Assuming that the run-off from the upper basin of 32.4 sq. miles was as great as at South Alamo Street, 5 miles down stream, that is, 10,000 acre-ft., according to the estimate, the run-off from the Olmos basin was about 42 per cent. Regarding the Thursday night and Friday rains, amounting to an average of 6.5 in., as producing only 10 per cent of the actual run-off, there would have occurred an average run-off of not more than 70 per cent from the 5.5-hour rain of Friday night falling on presaturated ground and amounting to from 3.5 to 15 in.

The flood peak on the Upper San Pedro Creek was not excessive either from the run-off of the earlier local storm, or from the later overflow from the river. The maximum discharge was possibly 1,500 sec-ft. from 2 sq. miles.

"On the Alazan Creek, the water-shed of which is ideal for a quick flood concentration and on which a small earth dam was washed out, the peak flow was approximately 330,00 sec-ft. from 16.9 sq. miles, or at a rate of 1.950 sec-ft. per square mile.

"The Apache Creek is estimated to have flowed at a rate of 15,500 sec-ft. from 22 sq. miles, or 704 sec-ft. per square mile."

PUBLIC WORKS

Published Weekly
at 243 W. 39th St., New York, N. Y.

S. W. HUME, President J. T. MORRIS, Treasurer

Subscription Rates

United States and Possessions, Mexico and Cuba $3.00 year
All other countries .....$4.00 year

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Operating Sewage Treatment Plants

In the operation of sewage treatment plants "the bacteria are to be depended upon to do their work if given a chance. The human factor, however, generally fails to function properly, with the costly result that the plant fails to perform its duty."

Thus says Prof. John H. Dunlap, of the University of Iowa, in discussing the general state of sewage purification in the United States. As the result of inquiries addressed to the state boards of health, he learned that New Jersey alone required operators of sewage treatment plants to hold state licenses; that only five states require monthly reports from such operators and that only eighteen require the approval of plans for sewage treatment plants by the state board of health.

There are abundant reasons why such plants should be constructed and operated under state or federal supervision. Until there is such supervision, it can not be expected that there will be much improvement in a condition that is really serious, in that plants in which the taxpayers have invested millions of dollars are, in the great majority of cases, turned over to the charge of men both ignorant of how they should be operated and indifferent as to their success.

City Engineers and Consulting Specialists

A city engineer has to know something—or act as though he knew something—about more phases of engineering than perhaps any other class of engineers. He must construct sewers, bridges, pavements; collect and dispose of street and domestic refuse; perhaps operate sewage treatment and water purification plants, with their chemical and biological features; and must satisfy the citizens in general, and the powers that be in particular, that he is "onto his job" in these and a dozen other lines.

And it is greatly to the credit of our municipal engineers that he generally is, and the engineering features of United States cities compare favorably with those of any other country. But in any growing city there come times when specialized knowledge along one line or another is necessary or highly desirable—as for designing new sewarage or water supply systems or solving unusual problems in existing ones; deciding on a paving program, or one for the disposal of municipal refuse; preparing a city plan for future development, etc. And unless he is an exceptional man, a city engineer cannot find time from all his regular duties to become a specialist in any one of these branches, and only a super-man could be a thoroughly informed specialist in all of them.

When such specialized knowledge is required, therefore, it is no discredit to a city engineer if he ask that a specialist be employed to advise him; in fact, the discredit would lie in his being ready to risk the expenditure of the taxpayers' money without taking such advice. In case such expenditure is to be large, he should obtain such advice even though himself perfectly competent to design the work, considering it as a factor of safety, on the general principle that "two heads are better than one."

In the professions of medicine and law this is well recognized, and no imoprtant case is considered properly handled unless a consulting physician be called in or more than one lawyer be employed upon it; and the better class of general medical practitioners are continually referring their patients to eye specialists, nerve specialists, etc.

There would seem to be little question that city councilmen or others to whom the matter of employing a consultant must be referred, or any other intelligent citizen, will readily recognize the logic of the above if it is properly presented to them, and appreciate the broadminded attitude of their city engineer in asking that he be authorized to obtain advice with a view to making it more certain that the work contemplated will be creditable to them and to him. But to have the work prove a partial or total failure because of neglect of the engineer to request advice, may cause a setback to his advancement in the profession; and justly so, for good judgment is as necessary in this respect as in the purely engineering functions of designing and constructing public works.

Hydraulic Fill Dam Completed

The Lockington Dam, 6,600 feet high, was built in 3½ years at a total cost of $1,280,000 with 1,000,000 yards of hydraulic and drag line fill placed for drainage, 75 and 23 cents per yard respectively.

This dam controls the flood run-off from a drainage area of 255 square miles and by impounding 63,000 acre-feet of water, reduces the maximum flood discharge from 33,000 to 8,600 cubic feet per second, retarding the flow for 7 days necessary to empty the full 3,600-acre basin. About 3,500 feet of the dam consists of a low dike built in 1919 with a large dragline excavator, narrow gage track, locomotive and dump cars, at a cost of 23 cents per yard.

The main part of the dam, across Lorraine Creek valley, consists of a high earth dam and a massive concrete retaining wall outlet structure. The lower part of the high dam was built in 1919 with the aid of a Lidgerwood class K dragline excavator. The remainder of the embankment was constructed by the hydraulic fill process of which it affords a notable example.

Considerable preliminary time and expense were involved in building a labor camp; construction of a railroad siding, a power transmission line for electric current which operated most of the plant, a diversion dam to increase the water supply from a leader canal, an emergency pumping plant to insure adequate water supply for the City of Piqua; and in sand and gravel washing and screening plant and the installation of a large amount of heavy construction plant and equipment.

Material for the embankment was excavated by hydraulic giants in a 2,000- x 2,000-foot hillside borrow pit adjacent to the end of the main portion of the dam. Two 8-inch and one 14-inch electrically driven centrifugal pumps operated in various combinations in series and in parallel, supplied the two hydraulic giants, having changeable nozzles from 2½ to 5 inches in diameter, with water at from 40 to 175 pounds pressure according to the character of the material encountered.

Water from a feeder ditch constructed for the purpose around the upper edge of the borrow pit was used to sluice the paving material to a sump near the dam, whence it was pumped to the embankment. The giants required a supply of 10 second feet and about an equal amount that was used for sluicing was kept in circulation by pumps that returned it from the sump to the ditch, thus reducing the total consumption for which there was only a limited supply. The sluices were inclined from 2½ to 5 per cent.

At the sump two 14- and 15-inch United Iron Works, and American Manganese dredge pumps, direct connected to Allis-Chalmers motors, were installed and pumped the excavated material through suction pipes of from 12 to 15 feet lift, and delivered it to each side of the dam through a separate special 12-inch pipe made by the American Rolling Mills and operated under a maximum head of 115 feet. The solid material was distributed and classified by gravity and sedimentation to forman embankment with coarse materials on the outer slopes and very fine impervious material for the core.

The outlet structure is 82 feet high, 140 feet wide and 525 feet long and contains 32,000 cubic yards of concrete made with aggregate provided from the near by Dull sand washing plant. The concrete was delivered from the mixer in bottom dump buckets on narrow gage flat cars hauled by a gasoline locomotive and handled by two 120-foot guy derricks with 105-foot booms that also shifted the moveable forms.

The cost of the hydraulic fill was 75 cents per cubic yard, common labor receiving from 36 cents to 48 cents per hour and good carpenters from 65 to 80 cents. Most of the cement was purchased for $3.00 per barrel, and run-of-mine coal cost from $4.19 to $4.65 per ton. The first shovel full of earth was excavated March 1, 1918, pumping the hydraulic fill material was commenced June 12, 1919, the concrete work was completed May 27, 1919, and the hydraulic fill was finished August 20, 1921. The work was done by the Miami Conservancy District, Charles H. Paul, Chief Engineer.

Building Zone Ordinance Unconstitutional

The building zone ordinance of Dallas, Texas, which prohibits the construction of any business houses within what the ordinances designates as a residence district, except with the consent of three-quarters of the property owners of the district and approval of the building inspector as to the design of the proposed structure, has been held to be unconstitutional and void by the state supreme court.

The argument that the ordinance was for the protection of public health or public safety was held by the judge to be an idle contention, as was also the plea that a business building would impair the public comfort or be injurious to the public welfare. The judge declared that the ordinance was merely "to satisfy a sentiment against the mere presence of a store in a residence part of the city." He claimed that the law of the land would not permit a man to be deprived of the lawful use of his property because his tastes were not in accord with those of his neighbors. "Under the common law and in a free country a man has an unqualified right to erect upon his land non-hazardous buildings in keeping with his own taste and according to his own convenience and means, without regard to whether they conform in size or appearance to other structures in the same vicinity, even though they may tend to depreciate the value of surrounding improved or unimproved property."

This judgment was brought about by a suit which has continued since 1916, when a citizen applied to the city for a permit to erect a brick business house in a residence district. The city has no recourse except to seek a new hearing before the supreme court.

Recent Legal Decisions

CITY'S POWER TO CONSTRUCT WATER RESERVOIR IN PARK

In a suit to enjoin the city of Seattle from constructing, at a selected site in Volunteer Park, a reservoir for the storage of water for the use of the city and its inhabitants, the Washington Supreme Court holds, Ferry v. City of Seattle, 200 Pac. 336, that, the land having been purchased by the city, which took title in fee simple, the fact that the city made expenditures and used the land for park purposes does not prevent it from using part of the park for a water reservoir on the theory of an irrevocable dedication for park purposes. And the proposed reservoir would not be enjoined as a nuisance merely because of the possibility of its construction on a hill, causing a subsidence of the ground, or the escape of water, without evidence that these would be the necessary or probable results. In such cases the test is not what may possibly occur, but what may be reasonably expected to happen.

EXTENSION OF WATER WORKS SYSTEM TO EXCEED CONSTITUTIONAL LIMITATION NOT MANDATORY

Wisconsin St. 1919, par. 927-16, in so far as it authorizes cities to acquire and construct public utilities and issue bonds payable only from the revenue thereof and secured by mortgage liens thereon, does not create a corporate indebtedness within the constitutional limitation. But the Wisconsin Supreme Court holds, State v. City of Portage, 184 N. W. 376, that a city cannot be coerced into complying with an order of the Railroad Commission to make improvements in its water works system pursuant to like provisions of that statute relative to extensions, additions and improvements, if the city would by so doing exceed its constitutional indebtedness. The effect of compliance with such order would be to mortgage the city's existing water works to secure the payment of a corporate debt incurred after the works were acquired by the city.

PAVING RESOLUTION UPHELD—EVIDENCE THAT THE WORK WAS UNDERTAKEN WHEN PRICES WERE HIGHEST EXCLUDED

A resolution to pave, passed by a city council on March 19, 1920, was approved by the mayor on March 23, 1920. The law forbids the mayor to sign such a resolution within four days after its presentation to him, but provides that, if not returned within ten days after presentation, it shall take effect without being approved. The Minnesota Supreme Court holds, Hamre v. City of Thief River Falls, 184 N. W. 225, that the approval was nugatory, and the resolution could not be considered as returned, either as approved or vetoed, and it went into effect as for failure of the mayor to act. The trial court rightly excluded proof offered that the improvement was undertaken when prices therefor were the highest. There was no averment or offer of proof that the city council members were actuated by improper motives or exercised their judgment arbitrarily.

MUNICIPALITY HELD NOT LIABLE FOR UNEXPECTED KILLING OF FISH IN FISH POND ON CLEANING WATER RESERVOIR

The Utah Supreme Court holds, Lund v. Salt Lake County, 200 Pac. 310, that the county was not liable for the destruction of fish in the plaintiff's fish ponds from impure water allowed to flow therein from the county's water supply reservoir after it had been flushed, on the theory of a nuisance, the injury being an unexpected result of the cleaning of the reservoir. And no recovery could be had as for property taken or damaged for public use without just compensation, the damages not being the direct consequence of the exercise of the right of eminent domain.

LIMITATION OF INDEBTEDNESS

The Alabama Supreme Court holds, Town of Camden v. Fairbanks, Morse & Co., 89 So. 456, that section 225 of the Alabama Constitution, 1901, limiting the indebtedness of cities and towns to 5 per cent of the assessed value, but permitting an additional indebtedness of 3 per cent for construction or purchase of water works, etc., is not violated by a contract for the purchase by a municipality of machinery for use as part of its water works.

CITY NOT LIABLE TO EMPLOYEE OF RAILROAD OPERATING WITHOUT FRANCHISE BY VIOLATION OF LIGHT POLE ORDER

The fact that a city erects an electric light pole less than eight feet from the centre line of a railroad track, in violation of an order of the State Railroad Commission, does not render it guilty of negligence as respects the rights of a brakeman injured by coming in contact with the pole while climbing the side of a box car extending over the line of the street, where the railroad was operating in the street without a franchise. There cannot be neglect without the existence of a corresponding duty.—Sincerney v. City of Los Angeles (Cal. App.), 200 Pac. 380.

TO RESTRAIN COLLECTION OF SIDEWALK TAX, THE PLAINTIFF MUST SHOW PROPERTY INTEREST

In order to entitle a plaintiff to temporary injunction restraining the collection of a sidewalk tax, the Idaho Supreme Court holds, Crane v. City of Harrison, 200 Pac. 892, that the complainant must show some present interest in property or liability for payment of tax.

CONTRIBUTOR NEGLIGENCE IN STEPPING ON SEWER INLET-COVER

In an action by a pedestrian against a city for injuries sustained by stepping on an iron cover over a sewer inlet, while passing from the cartway of a street to the sidewalk, it was held, in Kirshner v. Philadelphia, 75 Pa. Superior Ct. 231, that judgment was properly entered for the defendant city where it appeared that the accident happened in broad daylight, that the plaintiff was familiar with the location, and that he admitted he had not looked at the inlet-cover as he stepped on it, and there was also evidence that the cover was tilted on one side, which the plaintiff could have seen if he had looked.

NEWS OF THE SOCIETIES

Dec. 13—ENGINEERING SOCIETY OF BUFFALO. Iroquois Hotel, Buffalo. Secretary, N. L. Nussbaumer 80 W. Genesee Street, Buffalo.

Dec. 13-14 — EASTERN PAVING BRICK MANUFACTURERS ASSOCIATION. Annual meeting. Pennsylvania Hotel, New York City.

Dec. 14 — NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies' building, New York City.

Dec. 15—ENGINEERS' CLUB OF CINCINNATI. Cincinnati.

Dec. 15 — BRIDGEPORT BRANCH, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Hotel Stratford. Secretary Arthur R. Parker, Watrous Engineering Co., Bridgeport.

Dec. 15 — MERIDEN BRANCH, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Home Club. Sec. E. W. Carruth, Aeolian Co., Meriden.

Dec. 15—TOLEDO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Loring Freed, Atlas Chemical Co.

Dec. 16 — ASSOCIATED PENNSYLVANIA HIGHWAY CONTRACTORS. Second annual meeting. Joint meeting with HIGHWAY CONSTRUCTION INDUSTRY OF PENNSYLVANIA, Penn-Harris Hotel, Harrisburg, Pa.

Dec. 16—METROPOLITAN SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, G. I. Rhodes, 115 Broadway, N. Y. C.

Dec. 20—PHILADELPHIA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Chamber of Commerce. Secretary, Prof. W. H. Kavanaugh Un. of Penn.

Dec. 22-23—KANSAS ENGINEERING SOCIETY. Annual meeting. Hutchinson, Kan. Secretary, J. M. Averill, Topeka.

Dec. 27-30—AMERICAN ECONOMIC ASSOCIATION. Pittsburgh, Pa.

Dec. 28-29 — AMERICAN ASSOCIA- FOR LABOR LEGISLATION. Fifteenth Annual Meeting Pittsburg. Frederick MacKenzie, Director of Publicity, 131 E 23rd St., New York.

Dec., 27-31 — AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, SMITHSONIAN INSTITUTE, Washington, D. C. Toronto, Canada.

Jan. 4-14 — CLEVELAND, OHIO, BUILDING EXPOSITION. Municipal auditorium, Cleveland, Ohio.

Jan. 5-6 — AMERICAN ENGINEERING COUNCIL, FEDERATED AMERICAN ENGINEERING SOCIETIES. Annual meeting, Washington, D. C.

Jan. 17-19 — IOWA ENGINEERING SOCIETY. 34th annual meeting. Sioux City. Secretary—Lloyd A. Canfield, Des Moines, Ia.

Jan. 17-19—ASSOCIATED GENERAL CONTRACTORS. 3rd annual meeting. Hotel Winton, Cleveland Ohio.

Jan. 17-20—ASSOCIATION OF CANADIAN BUILDING AND CONSTRUCTION INDUSTRIES. 4th annual conference. Royal Connaught Hotel, Hamilton.

Jan. 17-20 — AMERICAN ROAD BUILDERS' ASSOCIATION. Annual Convention and good roads show. Chicago, Ill.

Jan. 18-19—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting. New York City.

Jan. 27 — NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies' Bldg., New York City. Secretary—G. I. Rhodes, 115 Broadway, New York City.

Feb. 13-16—AMERICAN CONCRETE INSTITUTE. Convention Cleveland. Secretary Harvey Whipple, 814 New Secretary Harvey Whipple, 814 New Telegraph Building, Detroit, Mich.

Feb. 12-17 — CONFERENCE OF HIGHWAY ENGINEERING, 8th annual conference. University of Michigan, Ann Arbor, Mich.

Feb. 15-17—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Tenth midwinter convention. Engineering Societies' building, New York City.

Feb. 21-23 — MINNESOTA FEDERATION OF ARCHITECTS AND THE MINNESOTA SOCIETY OF CIVIL ENGINEERS. First annual convention Curtis Hotel, Minneapolis.

Apr. 27-30—BUILDING OFFICIALS' CONFERENCE. Apr. 27-28, Cleveland, O.; Apr. 29, Massillon, O.; Apr. 30, Youngstown, O.

May 15-19 — AMERICAN WATERWORKS ASSOCIATION. Annual convention. Philadelphia, Pa.

AMERICAN ASSOCIATION OF ENGINEERS

At the quarterly meeting of the Board of Directors of the American Association of Engineers in Chicago, November 18 and 19, 1921, steps were taken to push construction and public service activities immediately through the 220 local units of the association. The meeting decided that the local organizations of the Association should stimulate construction throughout the country, especially in municipalities, in accordance with the suggestions and plans of the National Employment Conference held recently in Washington through active cooperation with municipal, federal, and state authorities. Similar action was also directed to the end that municipal engineering service be improved through an educational campaign for:

1. More certain tenure of ofice.
2. Having technical engineering work supervised by engineers.
3. Putting compensation on a basis of qualifications and service rendered.
4. Insisting that only the highest grade of engineering service be accepted.
5. Extensive cooperation with local civic organizations.
6. Encouraging engineers to prepare popular articles about municipal work such as paving, sewerage, sewerage disposal, sanitation, water supply, city lighting and city planning.

The point was emphasized that this educational work should be more for the general public and not so much for engineers.

Charters were granted to three new chapters: Greensboro, N. C., Vanderbilt University, and Mississippi Agricultural and Mechanical College. To date 800 new student members have joined the Association this fall. In the engineering schools of the University of Southern California, University of Arizona, and New Mexico State College 100 percent of all the engineering students are members of the American Association of Engineers.

AMERICAN SOCIETY OF CIVIL ENGINEERS

The meetings of December 7 and 8, 1921, were devoted to a discussion of the Tentative Specifications for Concrete and Reinforced Concrete contained in the Progress Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, published in "proceedings" for August, 1921. There were six sessions, at which the portions of the Report considered tentatively were:

Water-Proofing and Protective Treatment; Surface Finish; Depositing Concrete; Forms; Details of Construction; Design; Discussion of Design and Details of Construction; General Discussion of the Tentative Specifications for Concrete and Reinforced Concrete and of the Scope of the Joint Committee's Work; Quality of Concrete; Materials, and Proportioning and Mixing Concrete.

AMERICAN ASSOCIATION FOR LABOR LEGISLATION

The Fifteenth Annual Meeting is to be held at the William Penn Hotel, Pittsburgh, Wednesday and Thursday, Dec. 28-29. The most timely subject —*Unemployment, and what should be done about it*— will be handled by several persons who are thoroughly familiar with the subject. Recent important developments in workmen's compensation will also be discussed by leading authorities. The number of persons attending these meetings will be approximately 500, but all sessions are open to the public.

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION

The Annual Joint Conference was held at Pittsburgh, Pa., Dec. 6th and 7th. The program included the discussion of specifications at the advance meeting of the Advisory Committee, Dec. 5th. Addresses: "Heavy Clay Products Research and its Relation to Paving Brick Manufacture," by A. V. Bleininger, Homer Laughlin Pottery Co., chairman Technical Committee, Joint Clay Products Research Committee; "The Engineering Point of View Toward the Trade Association," by E. J. Mehren, editor, *Engineering News Record;* "What Trade Associations Are Doing for Their Members," by E. W. McCuullough, manager Fabricated Production Dept. U. S. Chamber of Commerce; and "Trade Associations and their Relation to Educational Institutions," by Arthur H. Blanchard, professor of Highway Engineering and Transport, University of Michigan, author and consulting engineer. There was an inspection trip of Allegheny County and Pittsburgh paving.

AMERICAN ROAD BUILDERS ASSO.

At the annual meetin in New York, Nov. 15, the officers elected were: President, H. L. Bowlby, Chief, War Materials Division, Bureau of Public Roads, Washington, D. C. Vice-president, Northeastern District, Charles J. Bennett, State Highway Commissioner of Connecticut, New Haven, Conn.

(Continued on Page 460)

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

COMBINATION HOIST AND AIR COMPRESSOR

The Combination Hoist and Air Compressor manufactured by the Novo Engine Co., was designed especially for bridge, elevated tank, and other steel erection work, within its capacity, and is useful for trench work—the hoist being used to lower and place pipe and the compressor for caulking or light rock drilling.

The outfit consists of a Novo Type TN non-reversible hoist driven by gears from a Novo 15 h. p. engine. A 6 x 6-inch single acting compressor, driven by belt on a clutch pulley, is mounted on an extension of the channel frame.

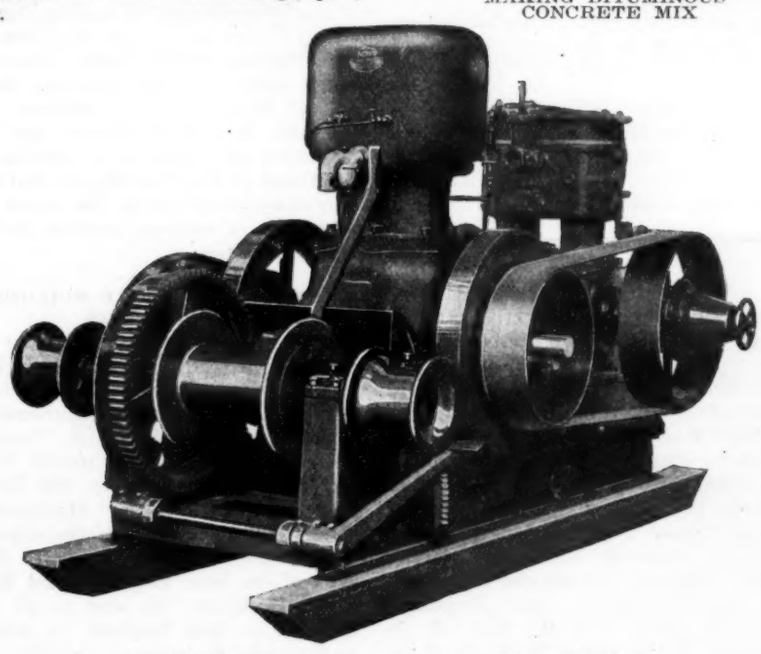
Both hoist and compressor are equipped with friction clutches so that either one may be operated independent of the other. The hoist drum holds 700 feet of ⅜-inch cable and has a niggerhead mounted on each end for handling scaffolding, eercting derrick, etc.

A contracting band friction clutch is mounted on the intermediate shaft for operating the drum or niggerheads and a powerful asbestos-lined foot brake equipped with a ratchet lock is supplied to hold the load.

The compressor has a displacement of 60 feet per minute, which is ample for handling one riveting hammer, caulking, light drilling, reaming, etc. An unloader is provided for cutting out the compressor when the supply of air exceeds the demand is adjustable and entirely automatic in its operation.

The crank case of the compressor is enclosed and is cast separate from the cylinder. The lower part of the crank case is filled with oil and at each revolution of the shaft the connecting rod splashes the oil on all bearings, pins, etc.

Both inlet and discharge valves are made of light sheet steel, seat quickly and quietly without wear on the cylinders and cause the machine to run practically noiseless.



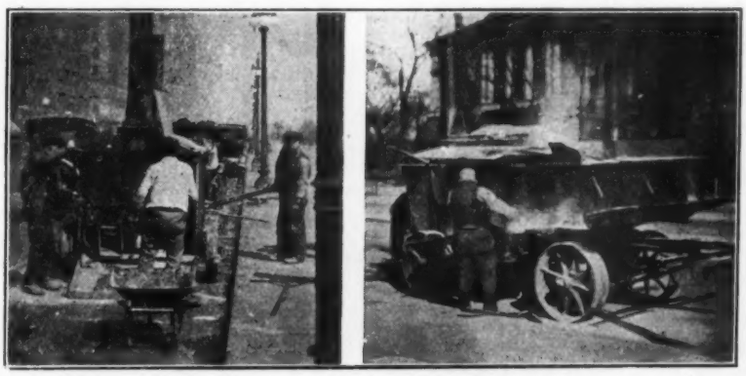
COMBINATION HOIST AND AIR COMPRESSOR

ASPHALT ROAD REPAIR OUTFIT

The road repair outfit manufactured by Littleford Bros. and sold by H. P. Andressen & Co., was designed to provide in a single apparatus everything required for the proper maintenance of modern roads and pavements. It combines in a single unit the heating or melting kettle, two bins for holding sand and stone, a combination mixing pan and tool carrier, a heater for tampers and motors, a coal burning furnace, a coal bin, a cement bin and auxillaries with four men, is compactly mounted on four wheels and arranged to be hauled by a team, a truck or a tractor. The arrangement is such that materials charged into the top of the wagon, are heated and delivered by gravity to the mixing pan in the rear ready for application to the cement.

It is not subject to derangement or breaking and does not require skilled labor for its operation. The 125 gallon asphalt, tar or water kettle is made with welded seams and is provided with two ½-inch drawoff cocks with screened outlets which can be used simultaneously for filling pouring pots, for penetration methods work, and for mixing and to serve the mixing pan for patches. The two 1-yard material bins are surrounded on all sides by hot air flues and are each provided with a 10 x 10-inch outlet controlled by a sliding door.

A steel rest bar in the fire box and notches in the lower edge of the door permit tools to be quickly heated without disturbing the fire. A 51 x 42-inch steel plate mixing pan and tool carrier is hinged to the rear of the wagon at road level and when hauled up by the supporting chains, serves as a carrier for all necessary tools. The 20 x 51-inch furnace, lined with fire brick tiles, has a steel ashpan and renewable sectional grate bars and is arranged with dampers permitting the heat to be concentrated either on the kettle or on the aggregate bins or on both. The two steel smoke stacks are each provided with self looking dampers which control



MAKING BITUMINOUS CONCRETE MIX

FILLING POT WITH MEASURED HOT ASPHALT

COMPLETE OUTFIT STARTING FOR DAY'S WORK

the temperatures. There is a 350-pound coal box with a capacity sufficient for one day's supply and a water-tight cement box with a capacity of 6 bags. The approximate shipping weight of the apparatus is 5,500 pounds.

The Andressen Road Repair Outfit is claimed to be the only one of its kind on the market, can be operated by three or four men, and is especially suitable for small patch work at remote points and for restoration or the repairing of cuts when the large plant is not in operation. It is also suitable for emergency or portland cement concrete work in the winter as it furnishes hot water, hot stone, hot sand and a mixing device in one apparatus.

WAYNE SECTIONAL GRAND STAND

The sectional grandstand manufactured by the Wayne Iron Works is a patented design and construction that has been approved by the Bureau of Building Inspection of Philadelphia. It is made of duplicate light steel sections that permit it to be built up in tiers of any length or height by the addition of standard pieces which may be dowelled securely together without requiring the use of any tools for its erection or removal. There are no small pieces and no bolts, screws, nails or pins. All pieces are interchangeable and fold flat for compact storage or transportation when not in use.

A stand 786 feet long and seven tiers high, was erected in Philadelphia, May 23, 1921, in one working day by a foreman and eight unskilled laborers and was removed by the same men in three hours. It had a seating capacity of 1,000 people and was entirely of steel excepting the wooden board seats.

INDUSTRIAL NOTES

FROM THE AMERICAN ROAD BUILDERS' ASSOCIATION

All of the initial 40,000 square feet of space for the forthcoming Thirteenth National Good Roads Show to be held at the Coliseum, Chicago, Ill., January 16 to 20 next. under the auspices of the American Road Builders' Association, having been reserved by 86 exhibitors at the first drawing in October, the officials in charge have arranged for about 20,000 square feet of additional space to care for a waiting list of about fifty firms not yet accommodated. Arrangements have been made by E. L. Powers, secretary for about 12,000 square feet of space in the balcony of the Coliseum and 8,000 to 10,000 more square feet in two buildings adjoining the Coliseum Annex on the South.

Diagrams showing the new space were sent to prospective exhibitors during the past few days. There were 144 exhibitors at the show last year and the indications are that the number this year will approach nearer the 200 mark. The show last year also broke all records for attendance. It is expected that the attendance this year will be even greater.

At a recent meeting of the directors of the American Road Builders' Association it was decided to open the show with a band concert on the night of January 16. The Twelfth American Good Roads Congress to be held in connection with the show will open on the following day. A meeting of exhibitors was held in Chicago Saturday December 3rd, at which excellent entertainment and program features were planned. Efforts are being made to secure special reduced railroad rates, all points to and from Chicago, for the week of the show. The Central Passenger Association has already granted a rate of one and one-half fare for the round trip throughout its Middle West territory, the reduction being made upon certification by passenger to the railroad agent at the show before the return trip. The indications are that all the other passenger associations will follow suit.

Many new features will be found in the show this year. The U. S. Bureau of Public Roads, will have a mammoth exhibit covering 2,000 square feet of space and will demonstrate, in addition to everything exhibited heretofore, the best methods of choosing sites for new roads, as well as tests of road materials, drainage and subgrades and the effect of impact on both pavements and subgrades

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The Osgood Company, of Marion, Ohio, announces the opening of a branch sales office at 1211 Conway Eldg., Chicago, Ill., Telephone No. State 5960, which will be in charge of Arthur B. Sonneborn, as Manager.

On December 15th, the New York Office of the Blaw-Knox Company, will move from the City Investing Building to the Carbide & Carbon Building, 30 East 42nd Street.

(Continued from Page 458)

Vice-president, Southern District, Frank Page, Chairman, North Carolina State Highway Commission, Raleigh, N. C. Vice-president, Central District, A. R. Hirst, State Highway Engineer of Wisconsin, Madison, Wis. Vice-president, Western district, W. W. Crosby, National Park Service, Estes Park, Colo. Secretary, E. L. Powers, Editor, *"Good Roads,"* New York, N. Y. Treasurer, Senator James H. MacDonald, former State Highway Commissioner of Connecticut, New Haven, Conn. Directors: Fred E. Ellis, Fred W. Sarr, R. A. Meeker, W. D. Uhler, S. E. Bradt, F. F. Rogers, George W. Tillson.

Routine business was transacted, a dinner was held at Automobile Club of America, and in the evening there were addresses by the officers and guests.

AMERICAN CONCRETE INSTITUTE

The program of the convention at Cleveland February 13, 14, 15 and 16, 1922, will be spread over nine convention sessions—two sessions a day for three days and three sessions on a fourth day. These will be divided as follows: two sessions for contractor problems—the practical problems on the job; two sessions for concrete products manufacturers; one session on Roads; one session on Houses; one session on Research; two sessions on Engineering Design and Inspection.

The Institute Committees are probably better organized this year to cover thoroughly the work of the concrete field than they have ever been before. While theoretically the A. C. I. has always stood for all development worthy of notice in concrete work, it has perhaps in its later years given more attention to technical and theoretical matters in some lines than to the practical problems of the field, which are as clearly important.

A special Committee on Organization appointed at the time of the last Convention was asked to review the whole field of technical activities of the Institute; to make certain recommendations to the Board of Direction as to the reorganization of old committees and the appointment of new ones, to outline a program for committee work, where committee programs did not already exist and to accomplish the whole thing with special reference to three distinct groups of interest represented in Institute membership, namely: Engineering Design and Inspection, Construction, Products Manufacture. This committee held two all-day meetings March 17 and May 4, and accomplished considerable by correspondence also. It presented its report at a meeting of the Board of Direction May 6, and with only minor modification, the report was adopted as a working program for Institute activities.

NEW ENGLAND ROAD BUILDING ASSOCIATION

The first annual dinner under the auspices of the New England Road Builders' Association will be held at the Hotel Somerset, Commonwealth Avenue, Boston, Mass., on Thursday, December 15, 1921, at 6 o'clock P. M. Frederick Hoitt, secretary, 168 Devonshire Street, Boston. Distinguished guests and some speeches are expected. This affair is open not only to members of the New England Road Builders' Association, but also to all road builders in New England, to material and supply dealers and friends. The cost will be $5 per person.